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February 24, 2017

Joseph Laydon
Town Planner
Grafton Municipal Center
30 Providence Road
Grafton, MA 01519

Subject: **Estates at Bull Meadow, Appaloosa Drive**
Definitive Plan Review

EXHIBIT 47
Received 2/24/17

Dear Joe:

We received the following documents on February 22, 2017 via e-mail:

- Correspondence from McCarty Engineering, Inc. to the Town of Grafton Planning Board dated February 22, 2017, re: Definitive Subdivision Revised Submission, Estates at Bull Meadow.
- Correspondence from McCarty Engineering, Inc. to Mr. Joseph Laydon, Town Planner dated February 22, 2017, re: Estates at Bull Meadow, Response to Peer Review Comments.
- Waiver Request Form, Estates at Bull Meadow – Definitive Subdivision submitted June 10, 2016 and revised February 22, 2017.
- Calculations entitled Pipe Design Worksheet, Estates at Bull Meadow dated June 10, 2016 and revised February 22, 2017.
- Sheets 8, 9, 10, 11 and 17 of plans entitled Definitive Conventional Subdivision Plans; Estates at Bull Meadow; North Grafton, Massachusetts dated June 10, 2016 and last revised February 22, 2017, prepared by McCarty Engineering, Inc. (5 sheets)

We also received the following document on February 23, 2017 via e-mail:

- Waiver Request Form, Estates at Bull Meadow – Definitive Subdivision submitted June 10, 2016 and revised February 22, 2017.

This letter is a follow-up to our previous review letters to the Planning Board dated July 19, 2016, November 1, 2016, January 19, 2017 and February 13, 2017. For clarity, comments from our previous letters are *italicized* and our latest comments to the design engineer's responses are depicted in **bold**. For brevity, comments previously addressed by the design engineer and acknowledged by GEI have been omitted. Previous comment numbering has been maintained.

This letter consists of updates to Comments # 28, 31 and 39.

Our comments follow:

Subdivision Rules & Regulations (SR&R)

5. *The profile for Paddock Ridge Drive shows fill greater than 6 feet between stations 12+75 and 14+60. We understand a waiver request was submitted and will be reviewed by the Planning Board. (§4.1.2.1.b)*
   No further comment necessary.

6. *The minimum K requirement for vertical curves was not met at station 12+24 (proposed sag curve with K=27) and at station 13+81 (proposed crest curve with K=6). (§4.1.5.3)*

   November 1, 2016:
   The minimum K requirement for a crest vertical curve is 28, however, a crest curve with K=7 is proposed at station 13+81. The Engineer responded that the curve meets the AASHTO requirement regarding sight distance for a design speed of 20 MPH. Nevertheless, the grades of the approach tangents are shallow and the height of the crest curve is low, such that a driver located in the low point of the road on one side of the vertical curve will be able to see an object in the road at the low point on the opposite side of the vertical curve. In short, based upon the information submitted with the revised plans and upon further evaluation of sight lines, we do not take issue with the sight distance provided at the crest curve and we find the K value of 7 to not be unreasonable in this particular situation.

   As for the sag vertical curve at station 12+24, the plans were revised to propose a K of 28. The issue at hand is the ability to observe objects in the road if illuminated by a vehicle's headlights. In our opinion, the plans should be revised to provide a minimum K of 35 as required. Such a revision will require the length of the vertical curve to be extended from 164 feet to 208 feet and will result in the low point of the vertical curve being moved approximately sixteen feet and raised approximately 0.9 feet, thereby not impacting the efforts already made to address stormwater management.
   Our opinion of the proposed crest vertical curve at station 13+81 stands; the proposed vertical curve is not unreasonable in this particular situation. As for the sag vertical curve at station 12+24, GEI acknowledges that the plans were revised to provide a K of 35 as requested.

7. *Street lights were not shown on the plans. (§4.7.6)*
   Acknowledged. Street lights have been added to the plans. We understand that the applicant will have to coordinate the final street light locations with the Grafton Board of Selectmen.

8. *The three hydrants proposed along Paddock Ridge Drive between Carriage House Lane and Bridle Ridge Drive are proposed at spacing greater than the required maximum of 500 running feet. If not already done, the Planning Board may wish to solicit comments from the Fire Department and Grafton Water District relative to hydrant locations. (§4.7.7.1)*
   The Engineer responded that they will solicit a response from the Grafton Fire Department and Water District.

11. *Concrete sidewalk needs to be shown across driveways. (§4.9.1)*
    The Engineer responded that a waiver has been requested not to install concrete sidewalks across proposed driveways. GEI has not received any additional

waivers as a part of this submittal; we understand waiver requests will be submitted directly to the Planning Board for review.

14. *Retaining walls are proposed within the Paddock Ridge Drive right-of-way between stations 12+50± and 14+45± and a waiver was requested. We understand that the Town of Grafton requires retaining walls to be outside the rights-of-way. (Schedule E, Standard Cross Section Minor Street B)*
No further comment. Please also see Comment #28.

Zoning By-Law

Comment was previously addressed and acknowledged.

Stormwater Management & Hydrology Review

22. *Soil testing has not yet been performed at Infiltration Basin 2 to demonstrate compliance with MassDEP's required two-foot offset to seasonal high groundwater. Based upon the soil testing data that was submitted (for fifteen building lots and Infiltration Basin 1), the proposed elevation for Infiltration Basin 2 does not appear to be unreasonable. Nevertheless, soil testing will have to be performed at infiltration Basin 2.*
The Engineer responded that soil testing will be conducted after Conservation Commission approval. Soil testing will also need to be performed at Infiltration Basins 3 and 4. Considering the extent of soil testing done to date, GEI does not take exception to this approach.

General Engineering Comments

28. *Guardrails and pedestrian barriers (e.g. chain link fences) need to be provided at the tops of the retaining walls.*

November 1, 2016:
A four-foot chain link fence has been added to the Precast Concrete Retaining Wall Detail, however, no guardrail is proposed between the roadway and the retaining wall. We believe a cross section of the right-of-way at the wetland crossing should be provided to show the proposed roadway, retaining walls, chain link fences, guardrails, sidewalk, and utilities.

January 19, 2017:
A cross section of the right-of-way at the wetland crossing has been added to Sheet 23. GEI respectfully defers to the Planning Board regarding the location of the retaining walls at the wetland crossing. We offer the following for consideration: the cross section did not include a grass strip between the roadway's sloped granite edging and the sidewalk. This grass strip would serve the purpose of separating pedestrians from vehicular traffic and for snow storage (otherwise snow storage will occur on the sidewalk). Ideally, a grass strip should be provided. However, if the cross section is to be implemented then the sloped granite edging on the sidewalk-side of the street should be changed to vertical granite curb to better prevent drivers from being able to drive onto the sidewalk.
We understand that the applicant and the Planning Board have discussed the road cross section at the wetland crossing. Sheet 8 of the plans was revised to include a leader note requiring "proposed vertical granite curb within the crossing limits"

on the sidewalk-side of the road. We concur with the use of the vertical granite curb in this location – wherever the sidewalk is contiguous to the curb.

General Comments

29. *We understand that the Planning Board or its staff will review any impact reports.*
    No further comment necessary.

30. *We understand that the Grafton Water District will review the proposed water utility infrastructure.*
    No further comment necessary.

31. *We are not aware if a meeting has occurred with Town staff/departments to address the configuration of the existing Appaloosa Drive cul-de-sac. At issue is whether the cul-de-sac should remain as is, be configured with an island or reconfigured as a through road. (MRSP 2014-8, Condition C3)*

    November 1, 2016:
    No further comment.
    We understand that the applicant and the Planning Board have discussed reconfiguration of the cul-de-sac. We concur with the revisions (leader notes and road/sidewalk layout) on Sheet 8 concerning the reconfiguration to a through road. However, we have a concern relative to capturing stormwater. When the plans are being finalized prior to Planning Board endorsement, the plans should be revised as necessary to direct stormwater to the two existing catch basins in the cul-de-sac. For example, it may be prudent to add a gutter inlet (a shallow structure often used when road edges are relocated) along the curb line near the southern catch basin to capture stormwater runoff and direct it to the existing catch basin. Also, with the elimination of terminal curbing at the cul-de-sac, it appears that the crown of the road may have to be adjusted to create more of a cross slope.

Additional Comments: January 19, 2017

39. *Upon further review, on Sheet 17, the 18" diameter drain pipes between DMH 14 and DMH 17 have pipe slopes that will result in excessive water velocities; velocities greater than 12 feet per second (fps). The pipe slopes need to be adjusted. Drops at the manholes may be necessary.*

    February 13, 2017:
    The plans were not revised. The design engineer responded that the existing outlet pipe from the abutting North Grafton Estates project should not have been allowed to discharge across an adjacent private property without an established easement and that this condition is causing a hardship on the Bull Meadow project by adding significant cost. We'd like to address three points:

    a. *With respect to the pipe discharge at the applicant's up-gradient property line, we believe that the design engineer is referring in general to a situation whereby existing stormwater runoff is distributed across a certain area and then under proposed conditions is to be concentrated and discharged at a specific point. If our understanding is correct, then we agree with the general reasoning that the creation*

of concentrated point sources should be avoided unless site-specific conditions necessitate otherwise.

b. *At the specific location of concentrated flow (the pipe outlet) and prior to construction of the abutting subdivision, there was a well-defined concentrated stormwater discharge point (i.e. a topographic valley or a swale) at the location of the pipe outlet. This situation is well-documented by way of the surveyed existing conditions topography and the pre-development hydrology modeling of the abutting project. The tributary area to this point at the property line consists of approximately 28.5 acres. In fact, the topographic valley can also be observed on the locus map on the Cover Sheet of the Bull Meadow Estates Definitive Plans. The topography on the Cover Sheet (ten-foot contour intervals) shows a channel originating to the west of the Bull Meadow Estates project, entering onto Bull Meadow Estates and terminating at a wetland on or near Lot 1. The plans show that the channel passes across the back of Lots 3 and 4 in what appear to be areas of the lots not to be disturbed, then the channel passes across portions of Lots 1 and 2 that are proposed to be developed. In short, the existing pipe up-gradient of Bull Meadow Estates did not create a new point of concentrated flow; the concentrated flow existed regardless of the abutting project.*

c. *Relative to the slope of the proposed 18" pipe, the design engineer was diligent in addressing water velocity at the discharge-end of the pipe; the lowest 250+/- feet of the pipe system is proposed with a slope that will provide satisfactory water velocities. Nevertheless, it is in the Town's long-term best interest to avoid excessive water velocities throughout the pipe system to avoid long-term scour of the pipes' interior caused by suspended debris in the stormwater. To address pipe slopes, the depths of three manholes in their present locations could be revised: DMH 14 (1.2+/- ft. deeper), DMH 15 (6.7+/- ft. deeper) and DMH 16 (1.7+/- ft. deeper). To reduce pipe slopes and generally maintain similar pipe depths, the manhole locations could be adjusted (e.g. move DMH 16 to station 1+60+/- and add a DMH at station 3+70+/-) concurrent with the pipe slope revisions. In short, although velocity at the discharge end is not an issue, ideally the entire pipe system should not be subject to excessive water velocity.*
Acknowledged. The plans and supporting calculations were revised to address the formerly-excessive water velocities.

We trust this letter addresses your review requirements. Feel free to contact this office if you have any questions or comments.

Very truly yours,
Graves Engineering, Inc.

Jeffrey M. Walsh, P. E.
Vice President

Cc: Brian Marchetti, P.E., McCarty Engineering, Inc.
Gordon Lewis, Bull Meadow, LLC.